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(54) Diving toy

(57) A diving toy has a motor operated by one or more batteries, a weight (15) located at an appropriate position within the toy so that the battery loaded toy will have a value of specific gravity approaching 1, a head portion (30), a body portion (10, 20) and a tail portion (40, 42, 50), the tail portion having a horizontally disposed rudder (51) pivotable about a horizontal axis, a vertically disposed rudder (50) pivotable about a vertical axis, and which pivotable movements are independent of one another and enable the rudders (50, 51) to be turned from one position to another so as to control and vary the course of the diving course and depth of the toy in water. The diving toy is capable of diving and ascending automatically and repeatedly in water when driven by the motor.

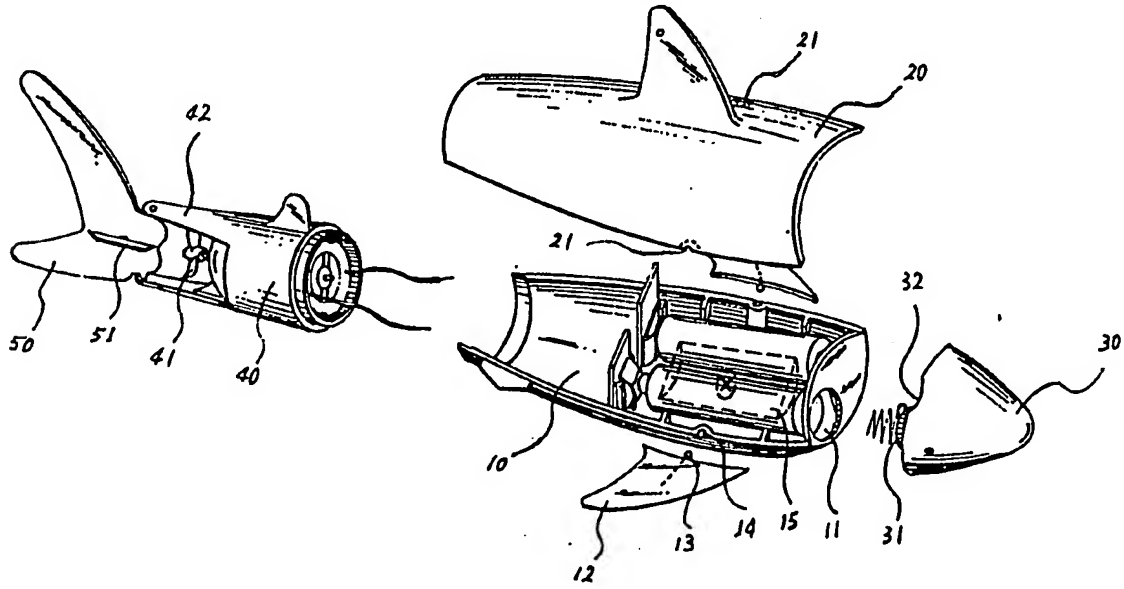

Fig. 1

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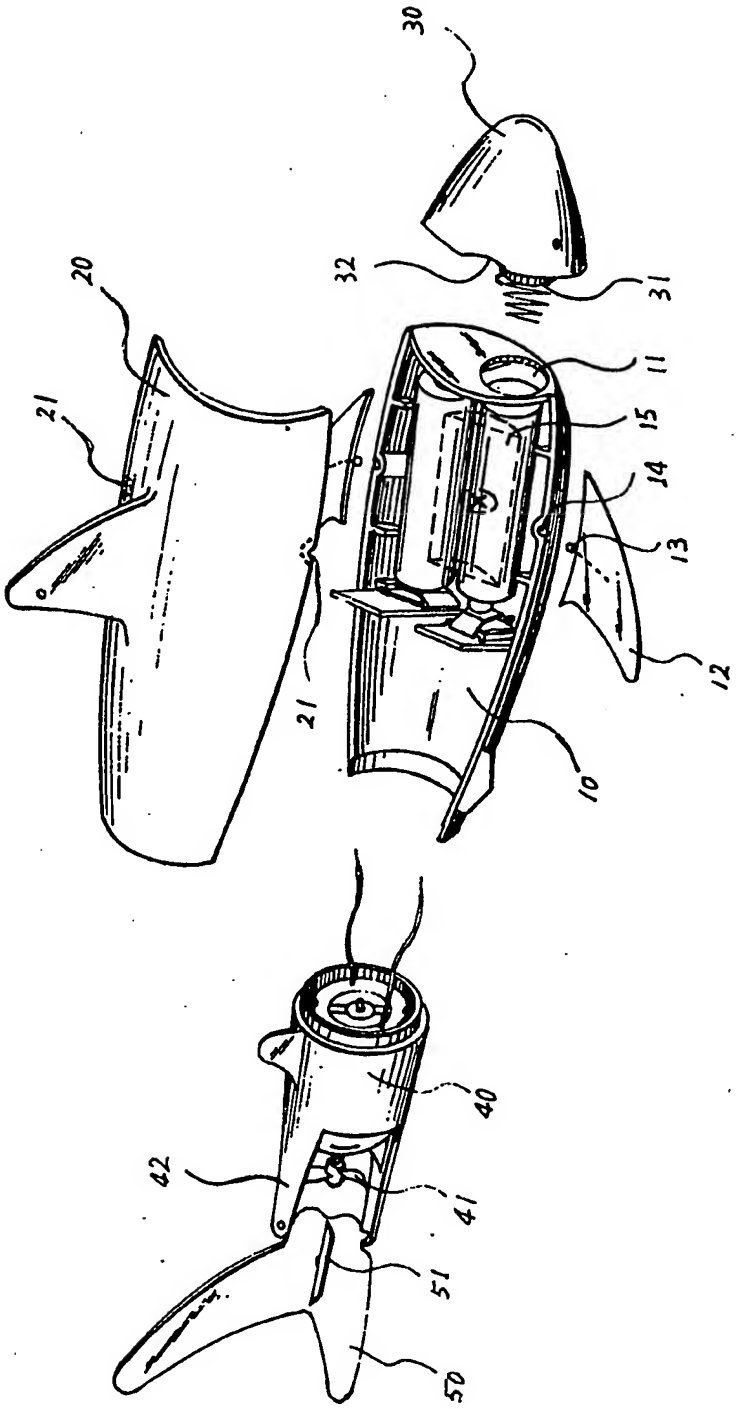

Fig 1

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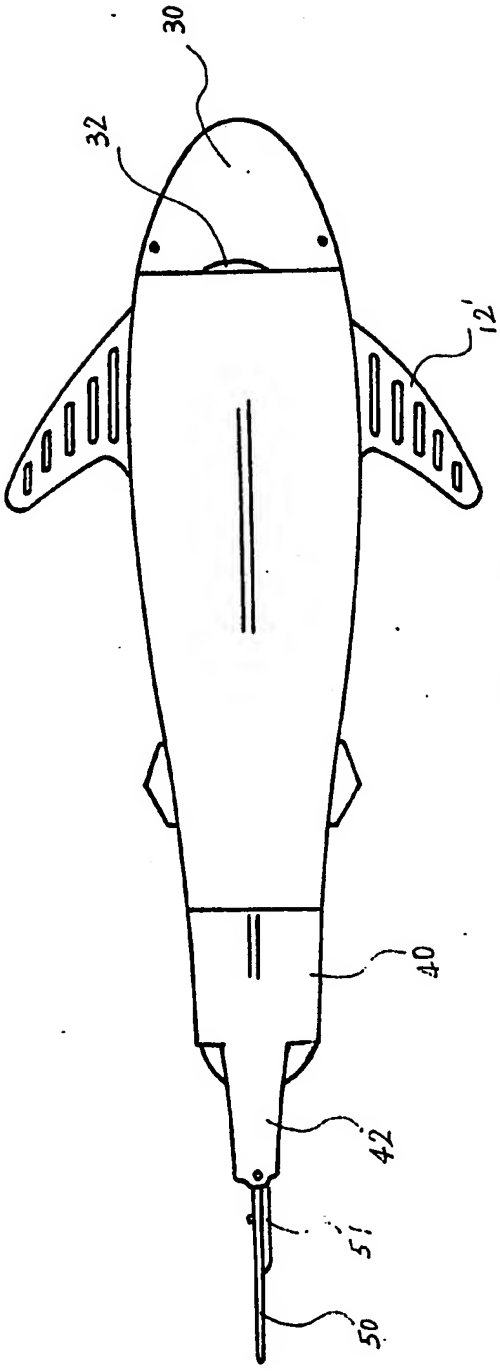

Fig 2

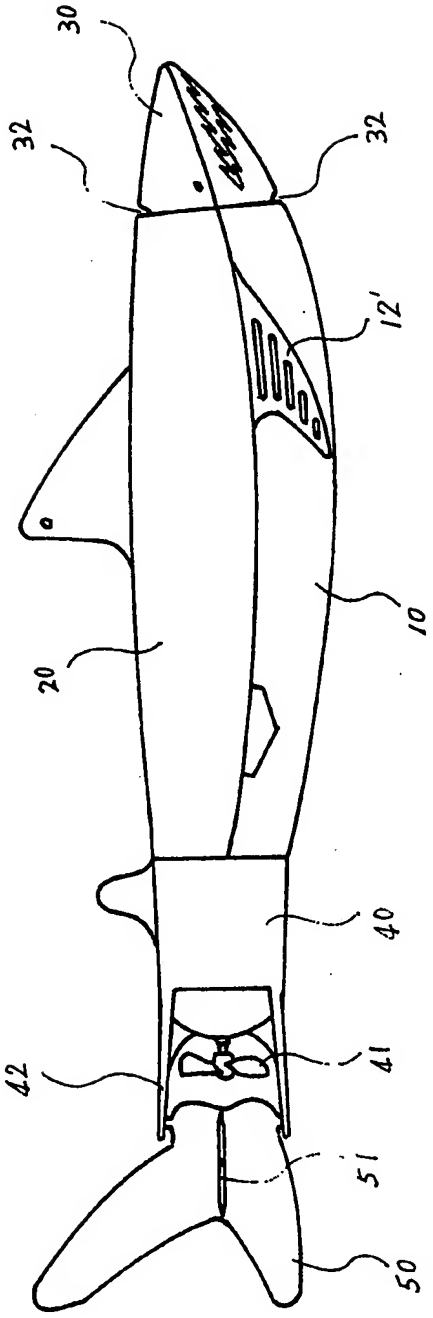

Fig 3

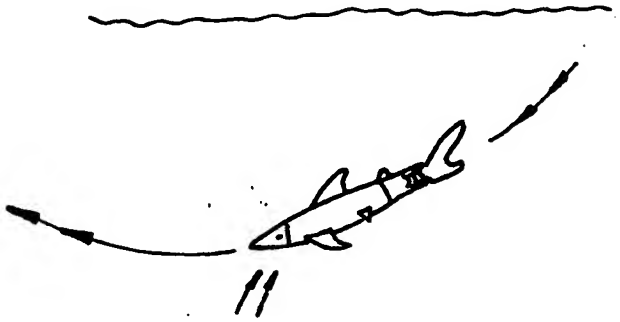

Fig. 5

Fig. 4

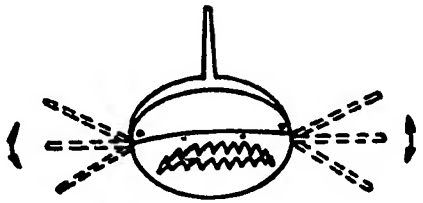

Fig. 8

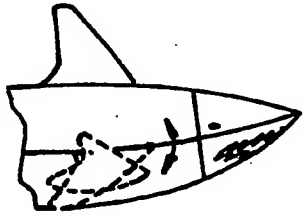

Fig. 7

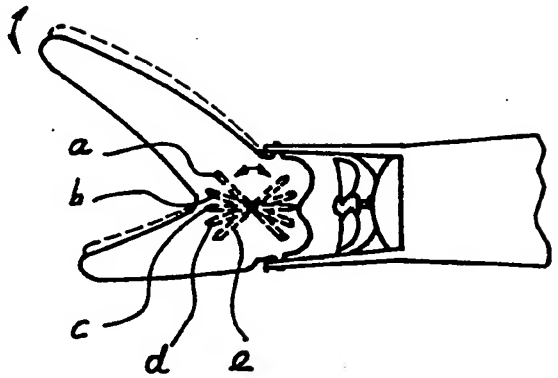

Fig. 6

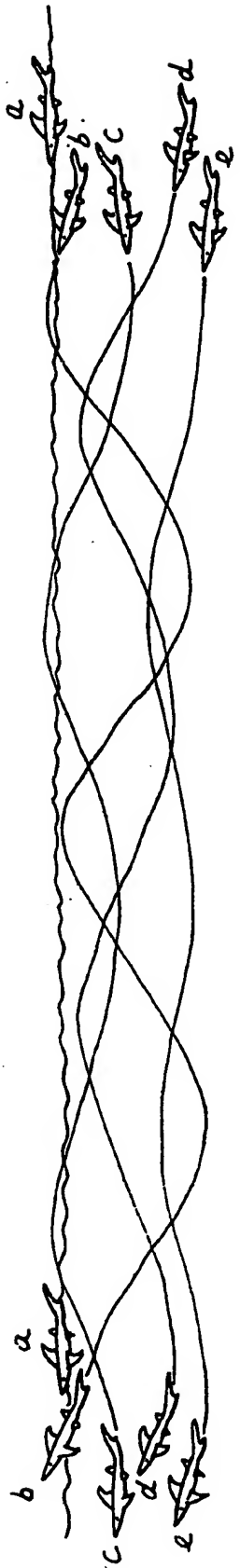

Fig 9

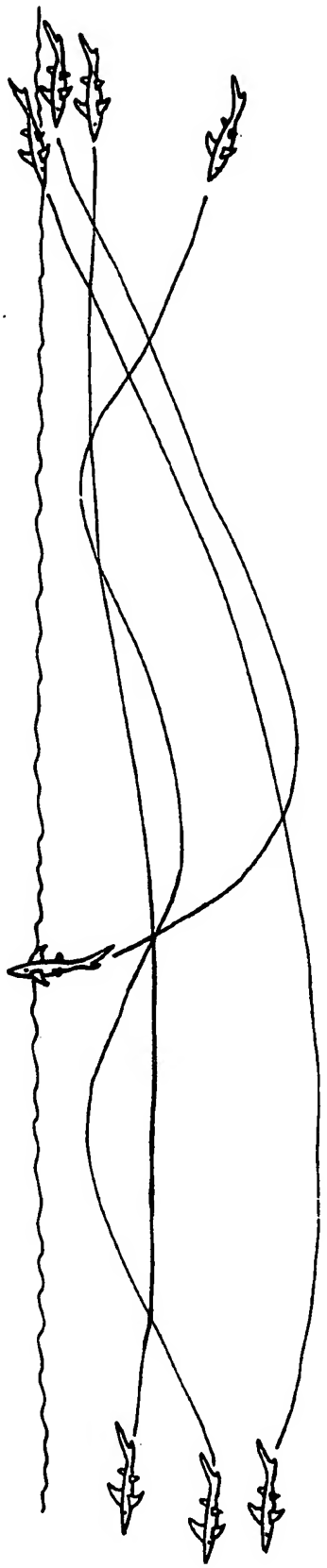

Fig 10

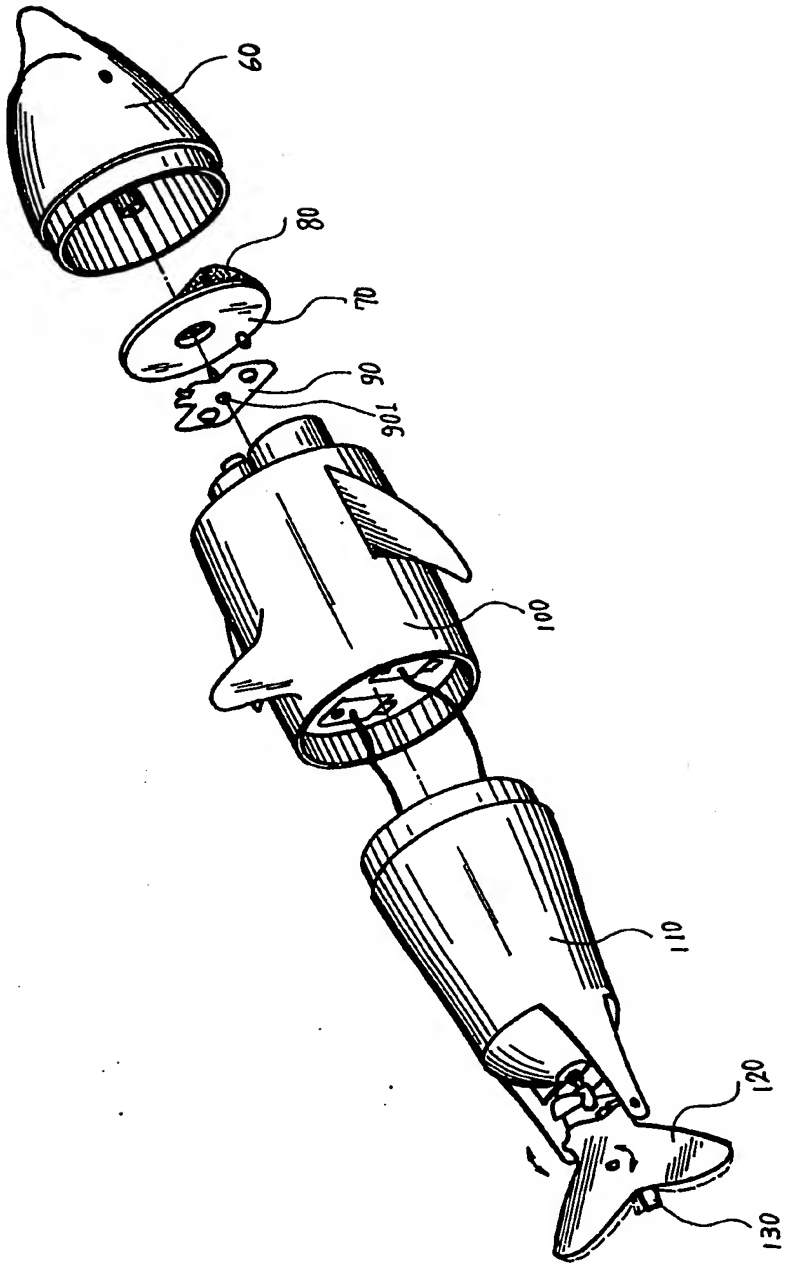

Fig. 11

SPECIFICATION
Diving toy

The present invention relates to a diving toy having a motor operated by one or more batteries, for example two batteries, a head portion, a body portion and a tail portion, the tail portion having a vertically disposed rudder and a horizontally disposed rudder. Preferably the diving toy is one which simulates the appearance of a fish or sea animal, the head portion simulating the head of a fish or sea animal and the vertically disposed rudder or horizontally disposed rudder simulating the tail of a fish or sea animal. With this invention the diving toy driven by a motor is so constructed as to be capable of diving and ascending automatically and repeatedly in water when the specific gravity (including battery or batteries) is arranged to have a value approaching 1.

The present invention is especially concerned with a toy fish or sea animal; the diving toy may for instance take the shape of a fish or a sea animal such as a dolphin.

However, with particular reference to a toy fish in mind it will be appreciated that, owing to the special design of the head of the fish, whose lower surface will be in the form of an upward curve, the balance of the fish in water is usually achieved only by adding weight inside the body of the toy fish and in coping with the current of the propelled water, the fish will automatically dive to a certain depth and then zoom up to the surface and continue this up-and-down course of action. However, the degree of adjustment of the balance required in water and the design of the body of the fish being difficult for mass production (note: a slight difference will greatly affect the normal function), it is advisable, therefore, to attach a horizontally disposed rudder to either or both sides of the tail of the fish for improvement of the diving performance.

When this small horizontally disposed rudder is pre-set, for instance by turning it to a certain degree, the balance of the fish in water will be greatly improved. The depth and course of diving of the fish can be varied according to the players' desire. In addition, two wings of the fish can be designed with a multi-directional joint by which the two wings can be adjusted. Due to the effect of hydro-drag, the fish will achieve some specific diving actions.

A submersible toy has been available for years, but its functions are monotonous. For example, in one known submersible toy a balance rod is used in the toy which, when pushed forward, the centre of gravity of the toy is moved forward to enable the toy to submerge, but when pulled backward, the centre of gravity of the toy is moved backward to enable the toy to rise. However, no matter how well the rod is adjusted, the toy cannot automatically submerge and rise. Although in recent years, a motor with reduction gears to enable a heavy article automatically rolling back and forth inside the toy has been suggested for use to help the toy submerge and rise, this course of action is too mechanical, and also to accommodate the usual two batteries which here are placed one after another in the toy body, the toy body will become too long to manoeuvre. The toy is unlikely to attract users.

With regard to another kind of an improved fish type submersible toy, having a ball in its body to help achieve functions of submerging and rising by means of impacts with the edge of a water pool, the rectangular shape battery cover provided on top of the said toy creates waterproofing difficulties and the size of the toy body is very big. It is also difficult to construct and to attain the required weight distribution in mass production. Another disadvantage is that normal diving functions may be influenced by using different brands of batteries (battery weight is slightly different with each brand of battery).

To overcome the above mentioned defects currently existing, the present inventor has skilfully designed, with a preferred form of the invention an adjustable horizontally disposed rudder to be attached to the vertically disposed rudder. The horizontal rudder is pivotably adjustable relative to the vertical rudder so as to let the current of the propelled water change direction and thus produce a force of reaction to enable the toy to dive and rise easily. Generally, when the battery power is strong, a slight battery weight difference will not affect diving functions of the toy appreciably (mixed high quality and low quality batteries or interchange of one quality for another will result in a great weight difference and consequently diving functions will also be affected). After some 10—20 minutes of use in water, a slight difference in battery weight and defects of the fish configuration (such as the curve on the lower part of the head, the size and shape of the wings, non-uniformity of the left and right portion of the body portion, the designed shape of the body, etc.) can seriously affect normal diving functions of the toy. However, with this invention unfavourable factors can be allowed for and deliberately controlled. For example, if a lighter weight battery is used and the fish does not dive, it is only necessary to adjust the horizontally disposed rudder. Accordingly, the current of the propelled water will direct itself downward, and thus produce a force of reaction which will help the fish dive and vice versa. Aside from effectively controlling unfavourable factors, users can also change the depth and course of diving by adjusting said horizontally disposed rudder at will to cope with the size and depth of the water pool, or other water source available. Besides, this invention in a preferred form thereof also includes a special design of movable wings whose inclination may be pre-set to affect the hydro-drag of the fish when moving forward to achieve a special diving effect.

According to the present invention there is provided a diving toy having a motor operated by one or more batteries, a weight located at an appropriate position within the toy so that the battery loaded toy will have a value of specific gravity approaching 1, a head portion, a body portion and a tail portion, the tail portion having, when the toy is viewed in a horizontal floating position, a first rudder which is disposed in a horizontal plane and is pivotable about a horizontal

axis and a second rudder which is disposed in a vertical plane and is pivotable about a vertical axis, which pivotable movements are independent of one another and enable the rudders to be turned from one position to another so as to control and vary the course of the dive and ascent of the toy in water, the diving toy being capable of diving and ascending automatically and repeatedly in water when driven by the motor. The said first rudder may consist of opposed rudder portions projecting from each side of the said second rudder. Alternatively, the said second rudder may consist of opposed rudder potions projecting from each side of the said first rudder. Preferably the first rudder or each said first rudder portion is pivotably adjustable relative to the said second rudder.

Where the body portion has a pair of opposed wings fixed thereto the wings may be slotted wings so as to minimize hydro-drag and increase the depth of diving for automatic diving and rising. In an expedient form of diving toy embodying the invention the body portion has a pair of opposed wings attached thereto by wing-moving means enabling the wings to move relative to the body portion; such wing-moving means may comprise a multi-directional joint.

In an especially preferred embodiment a rear part of the tail portion is bifurcate and the said part retains the said first or second rudder in such a manner as to allow the first or second rudder to move pivotably about a pin passing through the said bifurcate rear part, and preferably the body portion accommodates batteries and the tail portion accommodates the motor and the head portion constitutes a battery cover.

In an embodiment of the invention a battery housing in the body portion houses two cylindrical batteries side by side and the batteries are admissible into the battery housing through a circular aperture in the battery housing, which circular opening is closable by engaging means on the head portion in such a manner that the batteries will be sprung into engagement with respective electrical contacts within the battery housing.

By way of example, preferred embodiments of this invention will be described with reference to the accompanying diagrammatic drawings, wherein:

Figure 1 is an exploded perspective view of an embodiment of adjustable automatically diving toy in the form of a fish,

Figure 2 is a top view of a second embodiment of this invention,

Figure 3 is a side view of the second embodiment of this invention,

Figure 4 is a side view of an embodiment to indicate a force of reaction resulting from the current of the propelled water on the surface of the toy when it is going to dive,

Figure 5 is a drawing of the curve of the lower surface of the head of the fish against water pressure,

Figure 6 is a drawing illustrating the adjustability of a horizontally disposed rudder and a vertically disposed rudder employable in this invention,

Figure 7 is a drawing of the adjustable inclination of two wings of an embodiment of the invention.

Figure 8 is a drawing illustrating higher and lower positions of two wings of an embodiment of the invention,

Figure 9 is a drawing to illustrate that the depth and courses of diving can be changed by adjusting the horizontally disposed rudder,

Figure 10 is a drawing to illustrate how special effects can be achieved by pre-setting two wings of the diving fish.

Figure 11 is an exploded perspective view of a further embodiment of this invention.

Referring to Figure 1, most of the toy fish is made of plastics material. In general except for the tail of the fish and the head of the fish, all other parts of the toy fish are ultrasonically welded. There is a washer (not clearly visible) placed between the motor shaft (not clearly visible) and the motor housing 40 (tail portion) for waterproofing the motor. Therefore, the quality of waterproofness for the whole of the toy fish depends completely on the quality of the battery cover. Owing to the illustrated toy fish having a circular opening 11 for the battery cover, waterproofing efficiency will be achieved by inserting tube 31 of the fish head 30 into said opening 11 tightly. Since both the circular opening 11 and the tube 31 can be made precisely, the waterproofing effect will be much better than that generally experienced using a rectangular shape battery cover.

A suitable weight 15 (denoted more particularly by (x) is fixed to the bottom of the fish body so as to arrange for the specific gravity of the diving toy to approach a value of 1.

To operate the toy fish one battery is first inserted into the opening 11 and pushed aside inwards and then a second battery is inserted. Since there are battery contact strips at each end of the batteries, except for the end at the opening 11 when the head 30 with its tube 31 and attached spring wire and contact strip is turned tightly to its correct position, electrical contact is made automatically. In order to render the toy fish inoperative, it is only necessary to turn the head 30 away from its operative position and the battery is disconnected. Then the fish will float if left in the water and no water will reach the batteries within the battery cover.

A horizontally disposed rudder 51 is closely attached to either or both sides of a vertically disposed rudder 50 of the fish by means of a pin being put tightly into a small hole on the rudder 50. Said rudder 50 is also tightly pinned to motor housing 40 by means of two small tips of the rudder 50 being located in holes of a bifurcate part 42 extending from the motor housing 40. The rudder 51 is adjustable and can be manually pre-set at certain positions relative to the rudder 50 (see Figure 6) to change the depth and course of diving during operation. Owing to the two wings of the fish greatly affecting hydrodrag of the fish in water. it is possible to provide either fixed wings 12' with slots in them (as shown in Figures 2 and 3) or movable wings 12 with a multi-directional metal joint 13. Although the former has no variable characteristics, it is more economical to produce, while the latter can be made

by extruding together with the movable wings a slim rod in the middle point of the movable wing provided with a metal ball 13 on the tip of the rod. This metal ball 13 on the movable wing can be located in indentations 14 on both sides of a lower part 10 of the body of the fish which is tightly connected with an upper part 20 of the body of the fish also having indentations 21, thus making the two movable wings 12 adjustable to any required degree. To let air in the open space of the head 30 flow out quickly while in water, it is necessary to provide two openings in the middle section of the head 30. When the fish dives into thé water, air bubbles will be released, and hence not only are the above mentioned defects avoided but the dive becomes of greater interest.

As shown in Figure 4, the fish will automatically dive as soon as it rises to the surface provided that the design of the shape of the fish is adequate, namely one which minimizes hydro-drag and that the balance of the fish in water is suitable adjusted. This is because the force of the upper current of the propelling wash disappears at this moment while the lower current of the propelling wash remains and hence a force of reaction exists, and also because the specific gravity is near 1 which helps the fish dive easily. When the fish dives to a certain depth, the motor will be unable to propel it further forward due to the influence of hydro-drag. Owing to the upward curve designed for the lower surface of the head, hydro-drag exerted on the fish will automatically raise the head upward. It is not necessary to use moving balls inside the body of the fish. The reason is simple, but the problem remains with the difficulty in the designing of the body of the fish and the control of the balance of the body in water. A slight difference will greatly affect the manoeuvrability of the fish. For example, it may result in causing the fish to dive in a controlled manner only when circling to the left but lose all control while circling to the right. Because different brands of batteries have different weights, it is perhaps unlikely to be able to completely meet the requirement of the correct control of the fish balance. Further, becsuse the function is monotonous, it is hardly likely to attract the interest of users concerned with the study and principles of automatic diving and rising of the fish in water.

However, the toy fish illustrated having a horizontally disposed rudder 51 as shown in Figure 6 which, if turned to position a, b, c, d, e, etc. about a horizontal axis (see lower curved arrow of Figure 6) will cause the fish to dive along with different courses and depth as shown in Figure 9, is very interesting. If there are minor defects in production or differences due to different weights of the batteries, the influence of these defects or differences can be compensated by adjustment of the rudder 51 Therefore, normally nothing will disturb the fish in its normal diving and rising automatically. Figure 6 also shows by means of the upper curved arrow and dotted lines how the vertically disposed rudder 50 of Figure 1 is adjustable about a vertical axis. In this way the diving behaviour of the toy can be further controlled or modified as desired. As shown in Figures 7 and 9, the hydro-drag of the fish will be greatly affected by adjustment of the inclination and/or positioning of the movable wings which will cause the fish to achieve different diving courses as shown in Figure 10.

Referring to Figure 11, this illustrates a diving toy in the shape of a dolphin. In contrast to the other embodiments of this invention, the tail acts as a horizontally disposed rudder 120, while a small strip projecting from said tail 120 acts as a vertically disposed rudder 130. The upper curved arrow indicates that rudder 120 is adjustable by its pivotable movement about a horizontal axis and the lower curved arrow indicates that rudder 130 is adjustable by its pivotable movement about a vertical axis. Both the front circular opening and the rear circular opening of the body portion 100 are closable by engaging means on head portion 60 and tail portion 110 separately. Therefore, in manufacturing and assembling processes, the structure of this embodiment of this invention is simpler than that of the previously described embodiments.

By setting an appropriate weight 80 so attached to a disc 70 in the head portion 60, the specific gravity of this diving toy can be arranged to be near 1. By turning the disc 70, which is pressed lightly by a screw 901 and a metal strip 90, the weight 80 may be so adjusted to different high or low positions so that the centre of gravity of the toy will change and some special effects can be achieved, for example, twisting up and down. When the head portion 60 is turned tightly to its correct position, the contact strip 90 will touch both the positive and negative poles of the batteries, and electrical contact is made.

CLAIMS

1. A diving toy having a motor operated by one or more batteries, a weight located at an appropriate position within the toy so that the battery loaded toy will have a value of specific gravity approaching 1, a head portion, a body portion and a tail portion, the tail portion having, when the toy is viewed in a horizontal floating position, a first rudder which is disposed in a horizontal plane and is pivotable about a horizontal axis and a second rudder which is disposed in a vertical plane and is pivotable about a vertical axis, which pivotable movements are independent of one another and enable the rudders to be turned from one position to another so as to control and vary the course of the dive and ascent of the toy in water, the diving toy being capable of diving and ascending automatically and repeatedly in water when driven by the motor.

2. A diving toy according to Claim 1, wherein the tail portion includes a said first rudder consisting of opposed rudder portions projecting from each side of the said second rudder.

3. A diving toy according to Claim 1 or Claim 2, wherein the said first rudder or each said first rudder portion is pivotably adjustable relative to the said second rudder

4. A said diving toy according to any preceding Claim, which simulates the appearance of a fish, the

head portion simulating the head of a fish and the said second rudder simulating the vertically disposed tail of a fish.

5. A diving toy according to Claim 1, wherein the tail portion includes a said second rudder consisting of opposed rudder portions projecting from each side of the said first rudder.

6. A diving toy according to Claim 5, wherein the said second rudder or each said second rudder portion is pivotably adjustable relative to the said first rudder.

7. A diving toy according to Claim 1 or any either of claims 5 and 6, which simulates the appearance of a sea animal, the head portion simulating the head of a sea animal and the said first rudder simulating the horizontal tail of a sea animal.

8. A diving toy according to any preceding Claim, wherein the body portion has a pair of opposed wings fixed thereto.

9. A diving toy according to Claim 8, wherein the wings are slotted wings to as to minimize hydro-drag for automatic diving and rising.

10. A diving toy according to any one of Claims 1 to 7, wherein the body portion has a pair of opposed wings attached thereto by wing-moving means enabling the wings to move relative to the body portion.

11. A diving toy according to Claim 10, wherein the said wing-moving means comprise a multi-directional joint.

12. A diving toy according to any preceding Claim, wherein a rear part of the tail portion is bifurcate and the said part retains the said first or second rudder in such a manner as to allow the first or second rudder to move pivotably about a pin passing through the said bifurcate rear part.

13. A diving toy according to Claim 12, wherein the body portion accommodates batteries and the tail portion accommodates the motor and the head portion constitutes a battery housing cover.

14. A diving toy according to Claim 13, wherein a battery housing in the body portion houses two cylindrical batteries side by side and the batteries are admissible into the battery housing through a circular aperture in the battery housing, which circular opening is closable by engaging means on the head portion in such a manner that the batteries will be sprung into engagement with respective electrical contacts within the battery housing.

15. A diving toy according to Claim 14, wherein the centre of gravity of the toy can be adjusted by adjusting a weight to different high or low positions with reference to the toy in its normal stationary floating position.

16. A diving toy according to Claim 15, wherein the said weight is attached to a movable disc which is pressed lightly by a metal strip being fixed by a screw inside the head portion.

17. A diving toy substantially as herein described with reference to Figures 1 to 10 or to Figure 11 of the accompanying drawings.

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